Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended): A magnetic sensor system for determining the three-dimensional position, velocity and acceleration of an object utilizing magnetic field currents, said sensor system being capable of operating within close proximity to metal surfaces and metal objects, comprising:

an object, the position, velocity and acceleration of which are to be determined;

a three-dimensional fixed reference frame of known dimensions, wherein said object is located within said fixed reference frame;

a power source capable of generating a magnetic field within said fixed reference frame;

a plurality of magnetic field transmitters, said transmitters operatively interconnected to said power source and capable of being geometrically arbitrarily oriented relative to said fixed reference frame;

at least one magnetic field receiver, said receiver capable of receiving electronic signals from said transmitters and further capable of being geometrically arbitrarily oriented relative to said fixed reference frame;

a programmed computer, said computer capable of receiving said signals from said receiver and ~~further~~ comprising an extended Kalman filter capable of calculating the position, velocity and acceleration of said object based upon said signals.

2. (original): A sensor system as claimed in claim 1, wherein said power source is capable of generating DC magnetic fields, AC magnetic fields, pulsed DC magnetic fields, or combinations thereof.

3. (original): A sensor system as claimed in claim 1, wherein said transmitters are selected from the group consisting of induction loops, permanent magnets, and combinations thereof.

4. (original): A sensor system as claimed in claim 1, wherein said receivers are selected from the group consisting of induction loops, Hall effect sensors, and magneto-resistive magnetic field sensors.

5. (original): A sensor system as claimed in claim 1, wherein said sensor system is capable of recording individual receiver signals at high speed.

6. (original): A sensor system as claimed in claim 1, wherein said sensor system is capable of being self-calibrating.

7. (original): A sensor system as claimed in claim 1, wherein said transmitters are electronically compatible with said receivers.

8. (original): A sensor system as claimed in claim 1, wherein said transmitters are capable of generating frequencies in the range of 20-100 KHz.

9. (currently amended): A method for determining the position, velocity and acceleration of an object, comprising:

providing a three dimensional fixed reference frame of known dimensions;

providing an object, the position, velocity and acceleration of which are to be measured;

generating electrical current from an oscillator;

delivering said current from said oscillator to a power amplifier;

directing said amplified current from said amplifier to a plurality of transmitters;

generating a magnetic field from said transmitters in said reference frame;

receiving said magnetic field signal from said transmitters into at least one receiver;

demodulating and amplifying said received magnetic field signal into magnetic field components from said receiver signal, wherein said output from said amplifier is proportional to said magnetic field components;

applying an extended Kalman ~~mathematical~~ filter utilizing a mathematical algorithm to said demodulated and amplified signal~~; and~~

~~applying a mathematical algorithm~~ to calculate the position, velocity and acceleration of said object.

10. (original): A method as in claim 9, wherein said electrical current is selected from the group consisting of an alternating current source, a direct current source, a pulsed direct current source, and combinations thereof.

11. (original): A method as in claim 9, wherein said mathematical algorithm mathematically models said transmitters as dipoles, said algorithm further uses total field and vector magnetic field mathematical components to calculate said three-dimensional position of said object.

12. (original): A method as in claim 9, further comprising placing calibrated magnetic field receivers at a known location in an uncalibrated transmitter geometry, wherein said algorithm determines the location of said transmitter in said fixed reference frame.

13. (original): A method as in claim 9, wherein said algorithm mathematically averages said signals from said receivers.

14. (original): A method as in claim 9, wherein said algorithm mathematically treats eddy currents generated in metal surfaces and objects nearby said transmitters as virtual magnetic field transmitters, said algorithm further calculating the position and orientation of said virtual magnetic field transmitters.